

# Uncertainty analysis of calibration source with variable polarization degree in a wide dynamic range

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In order to satisfy the requirement of pre-launch laboratory calibration with high accuracy for polarization remote sensor, an innovative high precision calibration source with variable polarization degree in a wide dynamic range called VPOLS-II is proposed. VPOLS-II is composed of an integrating sphere and a polarization state adjuster (PSA). The PSA is made up of four parallel K9 glass plates which can be orientated from  $0^\circ$  to  $65^\circ$  by an accurately electromechanical driving mechanism and its rotation accuracy is better than  $\pm 5''$ . The DoLP adjustment range of VPOLS-II varies from 0 to 0.72 in the spectral range from 0.46 to 2  $\mu\text{m}$ . The theoretical model of VPOLS-II has been established for describing the relationship among refractive index of the glass, incident angle and the DoLP. An experiment for measuring the DoLP values of VPOLS-II by a Spectro-polarimetric Analyzer (SPOLA) is carried out. The results show that the difference between the measurement values and the theoretical values is no more than 0.8%. Mathematical analysis of major elements contributing to the DoLP uncertainty of VPOLS-II which affects the measured accuracy of the DoLP were performed. Main influencing factors which determine the accuracy of DOLP of the VPOLS-II are the refractive index of glass, the absorption of the plate glass, angle error of incident angle, the instability of the incident source and the parallelism of the incident source. The combined uncertainty is estimated to be about 1.998% – 0.902% and 0.902% – 0.156% within DoLP of 0.01 – 0.035 and 0.035 – 0.72, respectively. We can conclude that the VPOLS-II is significant to improve high-precision system-level performance test of the polarization remote sensor [1–4].

## References

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